
Friday
December 14, 1979

Part X

**Water Resources
Council**

**Principles and Standards for Planning
Water and Related Land Resources**

WATER RESOURCES COUNCIL

Principles and Standards for Planning Water and Related Land Resources

1. Notice is hereby given by the Water Resources Council that the Principles and Standards for Planning Water and Related Land Resources have been revised pursuant to the President's memorandum to the Chairman and Members of Water Resources Council, subject: Improvements in the Planning and Evaluation of Federal Water Resources Programs and Projects, dated July 12, 1978.

2. In accordance with that memorandum, the Principles and Standards have been revised to accomplish the full integration of water conservation into project and program planning and review as a means of achieving both the national economic development (NED) and environmental quality (EQ) objectives, and to require the preparation and inclusion of a primarily nonstructural plan as one alternative whenever structural project or program alternatives are considered. Additional changes were made to the Standards to assure consistency with the procedures for national economic development benefit and cost evaluation.

3. Only those sections of the Principles and Standards that have been revised or modified are published as part of this notice. The revised sections or parts of sections are italicized in this publication and referenced to the September 10, 1973 (38 FR 24778) Principles and Standards. Where no changes have been made, the words "No change" appear in parentheses after the title of the section.

4. The Council published on May 24, 1979, "Proposed Revisions to the Principles and Standards for Planning Water and Related Land Resources" (48 FR 30247) and invited public comment on the proposal. Comments were received through oral statement at the public meetings held on the proposal and through written submittal to the Council during the 60-day comment period.

5. Indicated below are the areas, listed by subject, where changes were made in the proposed revisions to the Principles and Standards as published on May 24, 1979:

a. Consideration and comparison of alternatives: conservation contrasted with storage.

b. Plan selection: discussion of net benefits.

c. Hydropower: measurement of benefits where utilities practice long run marginal cost pricing.

d. Water supply: measurement of benefits where communities practice long run marginal cost pricing.

e. Formulation of alternative plans: examples of nonstructural alternatives.

6. The Water Resources Council prepared an environmental assessment of the revisions to the Principles and Standards. Copies of this assessment may be obtained from the Director, U.S. Water Resources Council, 2120 L Street, NW., Washington, DC 20037.

7. These revisions shall be used for the planning of water resources projects covered in Section I.B of the Standards. The revisions apply to all levels of planning if such projects or plans are subject to the Principles and Standards. They shall be applicable to: (a) Projects and plans which may be approved by agency administrators, (b) projects and plans requiring congressional authorization, and (c) authorized projects or separable project features of such projects not yet under construction for which agencies currently prepare post-authorization planning documents. For the purpose of implementing these revisions, a project shall be considered under construction when funds have been appropriated by the Congress or budgeted by the President for land acquisition or physical construction activity. Projects for which post-authorization planning documents are not required shall be considered under construction when authorized for construction.

8. In reference to Level C studies, the Secretary of each Department shall retain the discretion to review those projects not under construction and, where deemed reasonable, may exempt a project from complying with these revisions or may partially exempt a project and direct expedited additional planning to more fully meet specific revisions. This discretionary authority applies to those projects not yet authorized for which preauthorization planning is now complete or will be completed by the end of FY 1980 and those authorized projects requiring post-authorization planning if such planning is now complete or will be complete by the end of FY 1980. Preauthorization or post-authorization planning shall be considered complete when the appropriate planning documents have been approved by the responsible agency's field office. Such Secretarial review is to ensure that adequate and reasonable discretion exists to prevent undue loss of time or expenditure of public funds in those cases where additional planning is not considered necessary. This discretionary authority shall not be exercised after July 31, 1981. Authorized projects exempted from

complying with the Principles and Standards shall also be exempted from complying with the adopted revisions.

9. The Council is presently undertaking further review and revision of the Principles and Standards with the objective of publishing the Principles and Standards as a proposed rule. This effort will include: (a) Revision for clarity and conciseness, (b) revision to incorporate the requirements of Urban and Community Impact Analysis and (c) revisions to integrate the requirements of the National Environmental Policy Act.

10. Pursuant to Section 103 of the Water Resources Planning Act (Pub. L. 89-80) the President approved the Principles as they appear herein. Pursuant to E.O. 11747 (38 FR 30993, November 7, 1973), the Chairman of the Water Resources Council approved the Standards as they appear herein.

11. These revisions to the Principles and Standards are effective immediately.

Leo M. Eisel,
Director.

Revisions to the Principles for Planning Water and Related Land Resources

I. Purpose and Scope (No change)

II. Objectives (No change)

III. Other Beneficial and Adverse Effects (No change)

IV. General Evaluation Principles

A. General Setting (No change)

B. Measurement of Beneficial and Adverse Effects (No change)

C. Price Relationships (No change)

D. The Discount or Interest Rate (No change)

E. Consideration and Comparison of Alternatives

A range of possible alternatives capable of application by various levels of government and nongovernmental interests should be *systematically evaluated in terms of their contributions to the national economic development and environmental quality objectives.*

Water conservation shall be fully integrated into project and program planning and review as a means of achieving both the national economic development and environmental quality objectives. Water conservation consists of actions that will (a) reduce the demand for water; (b) improve efficiency in use and reduce losses and waste; and (c) improve land management practices to conserve water. A clear contrast is drawn between the above conservation

elements and storage facilities for new supplies.

In addition, at least one primarily nonstructural plan will be prepared and included as one alternative whenever structural project or program alternatives are considered. This alternative and other plans should incorporate a combination of nonstructural or demand-reducing measures which could feasibly (in light of the national economic development and environmental quality objectives) be employed or adopted to achieve the overall project purpose.

Alternative plans should not be limited to those the Federal Government could implement directly under present authorities. Therefore the cooperative role of local, State, regional, and Federal organizations in implementing alternatives will be stressed. Plans, or increments thereto, will not be recommended for Federal development that, although they have beneficial effects on the objectives, would physically or economically preclude alternative non-Federal plans which would likely be undertaken in the absence of the Federal plan and which would more effectively contribute to the objectives when comparably evaluated according to these principles.

F. Period of Analysis (No change)

G. Scheduling (No change)

H. Risk and Uncertainty (No change)

I. Sensitivity Analysis (No change)

J. Updating Plans (No change)

V. Plan Formulation

Plans will be directed to the improvement in the quality of life by contributing to the meeting of current and projected needs and problems as identified by the desires of people in such a manner that improved contributions are made to society's preferences for national economic development and environmental quality. These plans should be formulated to reflect national, regional, State, and local needs or problems consistent with the above two objectives.

Planning of water and land resources is a part of broader public and private planning to meet regional and local needs and to alleviate problems. Therefore, planning for water and land resources should be carefully related to other regional or local planning activities and should include active participation of all interests.

Plans for water and land resources will focus upon the specified components of the objectives desired for the designated region, river basin, State, or local planning setting. These are

expressed in terms of projected needs and problems identified in each planning setting.

The planning process includes the following major steps:

- (1) Specify components of the objectives relevant to the planning setting;
- (2) Evaluate resource capabilities and expected conditions without any plan;
- (3) Formulate alternative plans to achieve varying levels of contributions to the specified components of the objectives, including preparation of at least one primarily nonstructural alternative;
- (4) Analyze the differences among alternative plans which reflect different emphasis among the specified components of the objectives;
- (5) Review and reconsider, if necessary, the specified components for the planning setting and formulate additional alternative plans as appropriate; and
- (6) Select a recommended plan from among the alternative plans based upon an evaluation of the trade offs between the objectives of national economic development and environmental quality and considering, where appropriate, the effects of the plans on regional development and social well-being.

A. Specification of Components of the Objectives

At the outset and throughout the planning process, the responsible planning organization will consult appropriate Federal, regional, State, and local groups to ascertain the components of the objectives that are significantly related to the use and management of the resources in the planning setting. These will be expressed in terms of needs and problems.

The components selected for use in formulating alternative plans should be of concern to the Nation, and the components should be those that can reasonably be expected to be substantially influenced through the management and development alternatives which may be implemented by Federal, State, or local entities. The components of objectives for which plans are formulated can be expected to change over time and between areas of the Nation as preferences and possibilities change and differ. These changes will be reflected in the Water Resources Council's Standards.

The objectives for which plans are formulated can also be expected to change over time as preferences and possibilities change. Changes in objectives will be accommodated only through revision of these principles.

The specified components will be defined so that meaningful alternative levels of achievement are identified. This will facilitate the formulation of alternative plans in cases where there may be technical, legislative, or administrative constraints to full achievement of objectives.

B. Evaluation of Conditions Without a Plan (No change)

C. Formulation of Alternative Plans

The planning process involves an evaluation of alternative means, including both structural and nonstructural measures, to achieve desired effects.

Based upon identified needs and problems, alternative plans will be prepared and evaluated in the context of their contributions to the objectives. This involves comparisons between objectives, and it will be necessary to formulate alternative plans that reflect different relative emphasis between the objectives for the planning setting.

The number of alternative plans to be developed for each planning effort will depend upon complementarities or conflicts among specified components of the objectives, resource capabilities, technical possibilities, and the extent to which the design of additional alternative plans can be expected to contribute significantly to the choice of a recommended plan. Because planning staffs are limited, emphasis should be placed on examination of those alternative waters and land-use plans which may have appreciable effects on objectives.

With respect to the number of alternative plans there will be a continuing dialog among the Water Resources Council, river basin commissions, and other planning groups, emphasizing on the one hand the need for national guidelines and overview of objectives for which alternative plans are formulated, and on the other the special insights into local planning situations that field level teams may develop.

Appropriate methods and techniques for estimating beneficial and adverse effects will be used to provide reliable estimates of the consequences and feasibility of each alternative plan.

One alternative plan will be formulated in which optimum contributions are made to the national economic development objective. Additionally, during the planning process at least one alternative plan will be formulated which emphasizes the contributions to the environmental quality objective. In addition, a primarily nonstructural plan shall be

prepared and included whenever structural project or program alternatives are considered. Other alternative plans reflecting significant physical, technological, legal or public policy constraints or reflecting significant trade-offs between the national economic development and environmental quality objectives may be formulated so as not to overlook a best overall plan. (The rest of this section remains unchanged.)

D. Analysis of Alternative Plans (No change)

E. Reconsideration of Specified Components of the Objectives (No change)

F. Plan Selection

From its analysis of alternative plans, the planning organization will select a recommended plan. The plan selected will reflect the relative importance attached to different objectives and the extent to which the two objectives can be achieved by carrying out the plan.

The recommended plan should be formulated so that beneficial and adverse effects toward objectives reflect, to the best of current understanding and knowledge, the priorities and preferences expressed by the public at all levels to be affected by the plan. A recommended plan (*when considered individually on the basis of with-project and without-project comparison*) must be justified on the basis that combined beneficial NED and EQ effects outweigh combined adverse NED and EQ effects. Therefore, a plan lacking net NED benefits may be recommended when EQ benefits are sufficiently large, even though the latter are not stated in dollar terms. A Departmental Secretary or head of an independent agency may make an exception to the net benefits rule if he/she determines that circumstances unique to the plan formulation process warrant such exception.

In addition to the recommended plan with supporting analysis, other significant alternative plans embodying different priorities between the objectives and in consideration of water conservation and nonstructural planning requirements will be presented in the planning report. Included with the presentation of alternative plans will be an analysis of trade offs among them. The trade offs will be set forth in explicit terms, including the basis for choosing the recommended plan from among the alternative plans.

VI. System of Accounts (No change)

VII. Cost Allocation, Reimbursement, and Cost Sharing (No change)

VIII. National Program for Federal and Federally Assisted Activities (No change)

IX. Implementation of Principles (No change)

X. Application and Effect

These Principles for Planning Water and Land Resources shall be implemented by the Water Resources Council and shall be applied by river basin commissions, other Federal-State organizations, and each of the Federal departments and agencies. The Office of Management and Budget, the Council on Environmental Quality, and other organizations in the Executive Office of the President will use these Principles in their review of proposed project, basin, or regional plans.

The Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources, approved by the President, May 15, 1962, printed as Senate Document 97, 87th Congress, 2d Session, together with Supplement No. 1 thereto, June 6, 1964, "Evaluation Standards for Primary Outdoor Recreation Benefits," and the amendment of December 24, 1968, 18 CFR Sec. 704.39, "Discount Rate," are revoked. (September 5, 1973).

These revisions to the Principles shall take effect immediately upon their publication by the Chairman of the Water Resources Council in the Federal Register.

Approved:

Jimmy Carter.

November 27, 1979.

Revisions to the Standards for Planning Water and Related Land Resources

I. Purpose and Scope (No change)

II. Objectives

A. Introduction. (The following completely replaces the existing section.)

The Principles for Planning Water and Land Resources define the objectives of national economic development and environmental quality. These objectives provide the basis for the formulation of State, region, and river basin plans for the use of water and land resources to contribute to meeting foreseeable short- and long-term needs and have been explicitly stated or implied in numerous congressional enactments and Executive actions. The most notable of these

actions in water and related areas are summarized below.

In the Flood Control Act of 1936, the Congress declared that benefits to whomsoever they may accrue of Federal projects should exceed costs. Interpretation of this statute has resulted in development of various analytical procedures to evaluate the benefits and costs of proposed projects. These procedures have centered around a national economic efficiency analysis and were first published as "Proposed Practices for Economic Analysis of River Basin Projects" in May 1950 and revised in May 1958. Budget Bureau Circular No. A-47 was issued on December 31, 1952, informing the agencies of considerations which would guide the Bureau of the Budget in its evaluations of projects and requiring uniform data that would permit comparisons among projects.

On October 6, 1961, the President requested the Secretaries of Interior, Agriculture, Army, and Health, Education, and Welfare to review existing evaluation standards and to recommend improvements. Their report, "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources," was approved by the President on May 15, 1962, and published as Senate Document No. 97, 87th Congress, 2d Session. This document replaced Budget Bureau Circular No. A-47 and in turn has been superseded by the "Principles for Planning Water and Land Resources," upon their approval by the President, and by these "Standards for Planning Water and Land Resources."

On July 12, 1978, the President directed that the Principles and Standards for Planning Water and Related Land Resources, (P&S), (38 FR 24778, September 10, 1973), be scrupulously adhered to in the planning, review and implementation of Federal water resources projects. Moreover, the President directed that the September 10, 1973 P&S be modified to accomplish the full integration of water conservation into project and program planning and review as a component of both the economic development and environmental quality objectives and to require the preparation and inclusion of a primarily nonstructural plan as one alternative whenever structural projects or program alternatives are considered. The revisions to the "Principles for Planning Water and Land Resources" and these revisions to the "Standards for Planning Water and Land Resources" become effective immediately.

By enacting laws and taking actions enumerated below and others, the Congress and the President have broadened the objectives to be considered in water and land resources planning.

The two objectives as defined in the principles and set forth in more detail in these standards provide a flexible planning framework that is responsive to and can accommodate changing national needs and priorities.

The statement of the objectives and specification of their components in these standards is without implication concerning priorities to be given to them in the process of plan formulation and evaluation. These standards, nonetheless, do recognize and make provision for a systematic approach by which the general public and decisionmakers can assess the relative merits of achieving alternative levels of satisfaction to the two objectives where there may be conflict, competition, or complementarity between them. This will provide the type of information needed to improve the public decisionmaking process.

B. Major Congressional and Presidential Directives

Many laws that give new or more definitive directions to Federal participation in planning for water and land resources have been passed in recent years. Some major enactments are:

The Federal Water Project Recreation Act of 1965 (Pub. L. 89-72), provides for full consideration of opportunities for recreation and fish and wildlife enhancement in Federal projects under specified cost allocation and cost-sharing provisions.

The Water Resources Planning Act of 1965 (Pub. L. 89-80), establishes a comprehensive planning approach to the conservation, development and use of water and related land resources. The Act emphasizes joint Federal-State cooperation in planning and consideration of the views of all public and private interests. Section 103 of the Act provides that "The Council shall establish, after such consultation with other interested entities, both Federal and non-Federal, as the Council may find appropriate, and with the approval of the President, principles, standards, and procedures for Federal participants in the preparation of comprehensive regional or river basin plans and for the formulation and evaluation of Federal water and related land resources projects."

The Act further provides in section 102(b) that "the Council shall * * * maintain a continuing study of the

relation of regional or river basin plans and programs to the requirements of larger regions of the Nation and of the adequacy of administrative and statutory means for the coordination of the water and related land resources policies and programs of the several Federal agencies; it shall appraise the adequacy of existing and proposed policies and programs to meet such requirements; and it shall make recommendations to the President with respect to Federal policies and programs."

The Act also provides in Section 301(b) that "The Council, with the approval of the President, shall prescribe such rules, establish such procedures, and make such arrangements and provisions relating to the performance of its functions under this title, and the use of funds available therefor, as may be necessary in order to assure (1) coordination of the program authorized by this title with related Federal planning assistance programs, including the program authorized under section 701 of the Housing Act of 1954 and (2) appropriate utilization of other Federal agencies administering programs which may contribute to achieving the purpose of this Act."

The Water Resources Planning Act, as amended, is attached as Appendix A.

The Public Works and Economic Development Act of 1965 (Pub. L. 89-136) establishes national policy to use Federal assistance in planning and constructing public works to create new employment opportunities in areas suffering substantial and persistent unemployment and underemployment. The Act provides for establishing Federal-State regional commissions for regions that have lagged behind the Nation in economic development.

The Water Quality Act of 1965 (Pub. L. 89-234) and subsequent amendments provides for establishing water quality standards for interstate waters. These water quality standards provide requirements and goals that must be incorporated into planning procedures.

In authorizing the Northeastern Water Supply Study in 1965 (Pub. L. 89-298), Congress recognized that assuring adequate supplies of water for the great metropolitan centers of the United States has become a problem of such magnitude that the welfare and prosperity of this country require the Federal Government to assist in solution of water supply problems.

The Clean Water Restoration Act of 1966 (Pub. L. 89-753) provides assistance for developing comprehensive water quality control and abatement plans for river basins.

The Department of Transportation Act of 1966 (Pub. L. 89-670) provides standards for evaluating navigation projects and provides for the Secretary of Transportation to be a member of the Water Resources Council.

The Wild and Scenic Rivers Act of 1968 (Pub. L. 90-542) provides that in planning for the use and development of water and related land resources consideration shall be given to potential wild, scenic, and recreational river areas in river basin and project plan reports, and comparisons are to be made with development alternatives which would be precluded by preserving these areas.

The National Flood Insurance Act of 1968 (title XIII, Pub. L. 90-448, as amended) provides that States, to remain eligible for flood insurance, must adopt acceptable arrangements for land use regulation in flood-prone areas. This provision, together with *Executive Order 11988, Floodplain Management*, and *Executive Order 11990, Protection of Wetlands*, both issued May 24, 1977, places increased emphasis on land use regulations and administrative policies as a means of reducing flood damages and protecting the natural and beneficial values of floodplains and wetlands. Planning policies must include adequate provision for these laws and directives in an integrated program of floodplain management. (The rest of this section remains unchanged.)

C. Relationships of Program Measures to Objectives (No change)

D. Objectives

1. National economic development. The national economic development objective is enhanced by increasing the value of the Nation's output of goods and services and improving national economic efficiency.

National economic development reflects increases in the Nation's productive output, an output which is partly reflected in a national product and income accounting framework designed to measure the continuing flows of goods and services into direct consumption or investment.

In addition, national economic development is affected by beneficial and adverse externalities stemming from normal economic production and consumption, imperfect market conditions, and changes in productivity of resource inputs due to investment. National economic development is also affected by the availability of public goods which are not accounted for in the national product and income accounting framework. Thus, the concept of national economic development is

broader than that of national income and is used to measure the impact of governmental investment on the total national output. The gross national product and national income accounts do not give a complete accounting of the value of the output of final goods and services resulting from governmental investments because only government expenditures are included. This is especially true in those situations where governmental investment is required to overcome imperfections in the private market. Therefore, national economic development as defined in these standards is only partially reflected in the gross national product and national income accounting framework.

A similar situation prevails where a private investment results in the production of final public goods or externalities that are not exchanged in the market.

Components of the national economic development objective include:

a. The value of increased outputs of goods and services resulting from a plan. *Development and management* of water and land resources result in increased or more efficient production of goods and services which can be measured in terms of their value to the user. Increases in crop yields, expanding recreational use, and peaking capacity for power systems are examples of direct increases in the Nation's output which result from water and related land resources *development and management*. Moreover, such *development and management* often results in a change in the productivity of natural resources and the productivity of labor and capital used with these resources. Increased earnings from changes in land use, reduced disruption of economic activity due to droughts, floods and fluctuating water supplies, and removal of constraints on production through increased water supplies or improved water *management* are examples of direct increases in productivity from water and land development that contribute to national output. *Development and management* of water and land resources may result in increased production from the employment of otherwise unemployed or underemployed resources, as well as contributions to increased output due to cost savings resulting in the release of resources for employment elsewhere.

b. The value of output resulting from external economies. In addition to the value of goods and services derived by users of outputs of a plan, there may be

external gains to other individuals or groups.

2. Environmental Quality (No change)

E. Effects on Objectives (No change)

F. Beneficial Effects on National Economic Development

Beneficial effects in the national economic development account are the increases of the value of the output of goods and services and improvements in national economic efficiency.

1. General measurement concepts.

There are two basic sources of increased output of goods and services that contribute toward enhancing national economic development. First, additional resources may be employed using normal production techniques, as, for example, in the application of irrigation water and other associated resources to land for the production of agricultural commodities or in the use of electric power and other associated resources for the production of aluminum. Second, resource productivity changes may be induced by the plan, resulting in more efficient production techniques to be used to achieve a higher level of output from the same resources or the same level of a specific output with fewer resources or the employment of otherwise unemployed or underemployed resources than would be achieved without the plan. In the latter case, the release of productive resources which can be employed elsewhere in the economy for the production of other goods and services ultimately results in an increase in national output as a consequence of a plan. *For example, reduced consumptive use of water in irrigation through improved water*

management may make that saved water available to irrigate additional acreage, provide for municipal use, or satisfy in-stream flow needs for fish and wildlife without construction of additional supplies. These two sources of increased output may apply to situations in which the plan results in the production of final consumer goods or intermediate producer goods utilized by direct users; and they may also apply in situations in which firms are indirectly affected through economic interdependence with firms which utilize the intermediate producer goods from the plan.

For convenience of measurement and analysis, beneficial effects on national economic development are classified as follows:

a. The Value of increased outputs of goods and services from a plan;

b. The value of output resulting from external economies caused by a plan.

In each case, with and without analysis must be applied to ascertain that with a plan there is a net increase in the production of goods and services, regardless of source, over those that would be obtained in the absence of the plan.

The general measurement standard for increases in the national output of goods and services will be the total value of the increase, where total value is defined as the willingness of users to pay for each increment of output from a plan. Such a value would be obtained if the "seller" of the output was able to apply a flexible unit price and charge each user (consumer) an individual price to capture the full value of the output to the user. This concept is illustrated in figure 1.

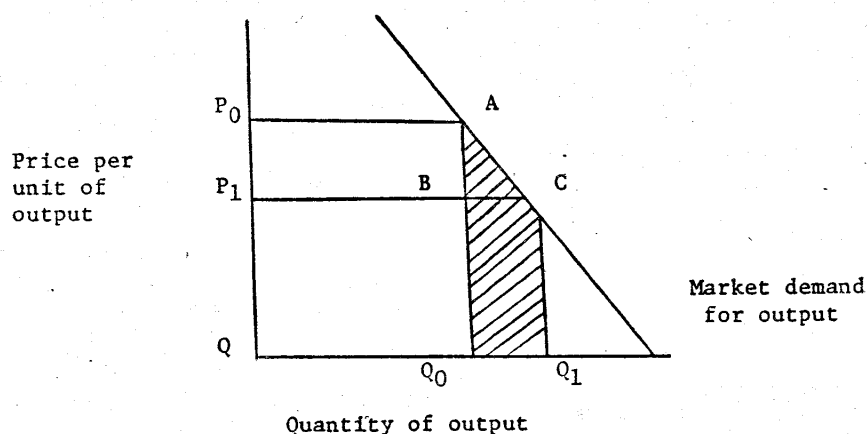


Figure 1. --Total value or willingness to pay for increased output.

Assuming the normal demand-output relationship, additional plan output will be taken by users as the unit price of output falls. If, as a result of the plan, output is increased by an amount $Q_1 - Q_0$, the total value of this additional output to the user is measured by the entire shaded area on the chart. This is a larger amount than would be reflected by the market value. It is the sum of market price times increased quantity (represented by the rectangle CBQ_0Q_1) plus the consumer surplus for that increase (represented by the triangle ABC).

Since, in most instances, it is not possible for the planner to measure the actual demand situation, three alternative techniques can be used to obtain an estimate of the total value of the output of the plan—willingness to pay based upon market price or simulated market price, change in net income, and the most likely alternative.

If the additional output from a plan is not expected to have a significant effect on price, actual or simulated market prices will closely approximate the total value of the output. This is true because there would be no consumer's surplus. If the additional output is expected to significantly influence market price (as in figure 1), a price midway between that expected with and without the plan may be used to estimate the total value. This would approximate the willingness to pay, including consumer surpluses, in most cases.

When outputs of a plan are intermediate goods or services, the net income of the (producer) user may be increased. Where changes in net income of each individual user can be estimated, a close approximation of the total value of the output of the plan (including consumer surpluses) will be obtained.

The cost of the most likely alternative means of obtaining the desired output can be used to approximate total value when the willingness to pay or change in net income methods cannot be used. The cost of the most likely alternative means will generally misstate the total value of the output of a plan. This is because it merely indicates what society must pay by the next most likely alternative to accrue the output, rather than estimating the real value of the output of a plan to the users. This assumes, of course, that

society would in fact undertake the alternative means. Because the planner may not be able to determine whether alternative means would be undertaken in the absence of the project, this procedure for benefit estimation must be used cautiously. *In determining the most likely alternative, the planner must give adequate consideration to nonstructural alternatives and conservation measures as well as structural alternatives.*

Application of these general measurement standards will necessarily vary, depending upon the source by which output is increased (that is, via direct increases in production or through subsequent employment of released resources), upon the type of good or service produced (whether the output is an intermediate or final good, and upon the type and nature of available alternatives. General measurement methods for each type of situation as well as an indication of the water and land resource plan outputs to which these standards are applicable are presented below.

a. Direct output increases. Direct outputs of water and land resource plans may be in the form of either final consumer goods or intermediate goods. An effective direct or derived demand must exist for the final and intermediate goods, respectively, to include the value of increased output as a contribution to national economic development.

Certain consumer goods and services may result directly from water projects and be used with no additional production resulting therefrom. Recreation, municipal water, and electric power for residential use are examples of this type of good or service. Most goods and services produced by using water are not directly consumed, however, but are intermediate products that serve as inputs for producers of final goods or producers of other intermediate goods. The development of irrigation water for use in producing food and fiber of supplying electric power and water for industry are examples.

The value of increased output resulting directly from plans that produce final consumer goods or services is properly measured as the willingness to pay by final users for such output. When a competitive market price is not directly available, and the

increased output will not be large enough to affect prices, total value of output may be estimated by simulated market prices or the use of the cost of the most likely alternative means of producing such final output. Examples of types of outputs to which these methods may be applied include:

- a. Community and residential water supply;
 - b. Electric power provided for community and residential use; and
 - c. Recreation enhancement.
- (The rest of this section remains unchanged.)

2. Measurement of the Value to Users of Increased Outputs.

a. Water supply. Plans for water supply are generally designed to satisfy requirements for water as a final good to domestic and municipal users and as an intermediate good to agricultural and industrial users. *Plan elements which satisfy requirements in these uses generally require, either separately or in combination, an increase in water quantity, and improvement in water quality, and an improvement in the reliability of both quantity and quality.*

Where it is necessary to use alternative costs for approximation of total value for water supply, as provided herein, the alternative selected must be a likely and realistic alternative directly responsive to achievement of this particular category, namely the additional output or more efficient use of water as an input to industrial, agricultural, and municipal uses or as a final good for community and individual uses. *Moreover, the alternative must be a viable one in terms of engineering. It must be more than a hypothetical project. It must be a real alternative that could and would likely be undertaken in the absence of the proposed program, for instance, the reuse of recycling of existing water supplies or the use of available groundwater, including the improvement of its quality, if necessary.*

Although water supply can often be considered as a final good, there usually does not exist a market that directly equates users' valuation of water supply for community and individual use with the full marginal cost of water supply. *This is because water is seldom priced at its marginal cost. Where a water utility is practicing long run marginal cost pricing the users' willingness to pay*

for additional supplies is verified if the utility is willing to contract for additional water supplies at the cost of providing those supplies. In this case an appropriate estimate of the benefits can be derived from the marginal water rates charged. Industrial self supply is also an example of a situation in which the beneficiary may be paying the full marginal costs of water supply and where such costs can be the basis for estimating benefits. Estimates of willingness to pay may also be derived by econometric methods applied to appropriate water use and price data. Where direct estimates of willingness to pay are not available, the value of added water supplies shall be derived using the cost of the alternative that would provide essentially a comparable water supply service, in both quantity and quality, that would in fact be utilized in the absence of the water supply provided by the plan.

The total value of water to the producers using increased supplies is reflected in the change in their net income with a plan for the provision of water supply compared with their net incomes without the plan. It is recognized that for many planning studies it is not possible to either specifically identify net income changes accruing to firms using water supply for productive purposes or always possible to determine what part of the municipal supply is used for productive pursuits or for general community or individual uses as set forth below. In these cases, total value to the users can be approximated by use of the cost of the alternative that would be employed to achieve the same production that would be utilized in the absence of the water supply provided by a plan.

(The rest of this section remains unchanged.)

b. Flood control, land stabilization, drainage, and related activities. A number of activities such as flood damage reduction floodplain management, drainage, reduction of sedimentation, land stabilization, and erosion control, contribute to the objectives through improving the productivity, use, and attractiveness of the Nation's land resources. From the viewpoint of their contribution to national economic development, the effect of these activities on the output of goods and services is manifested by increasing the productivity of land or by reducing the costs of using the land resources, thereby releasing resources for production of goods and services elsewhere. These activities affect land resources in the following manner:

(1) Prevention or reduction of inundation arising from stream

overflow, overland waterflow, high lake stages, and high tides, by protecting the natural streamflow of the floodway;

(2) Prevention or reduction of soil erosion, including sheet erosion, gullying, floodplain scouring, streambank cutting, shore or beach erosion, and prevention of sedimentation;

(3) Improvement of drainage and protection of wetlands; and

(4) Modification of limitations on land resources.

There are essentially three types of effects on land use that may occur as a benefit from including these activities in a plan. The first is an increase in the productivity of land without a change in land use. The second is a shift of land resources to a more intensive use. The third is a shift of land resources to less intensive use. In each case, the general method of calculating benefits is applicable. The distinction is made only to facilitate the application of the general method in different settings and as a means of providing criteria for the use of alternative techniques for estimating net income changes for the three classes of land utilization under the with and without analysis.

The general method to be applied in measuring effects for these and any other activities that result in a change in net productivity or a reduction in the cost of using land resources involves the measurement of the difference in net income accruing to users of land resources benefiting from such activities compared with what these users would earn in the absence of such a plan. This generally defines and establishes the limit of the willingness of users to pay for a plan that results in a change in productivity or reduction in the cost of using land resources.

Willingness to pay of the users, which is the basis for approximating the value of output from these activities, whether it be in the form of increased production of intermediate or final goods or release of resources, may be obtained by the following approaches.

(a) Productivity increase. In this situation, analysis with and without the plan indicates that the current and future enterprises employing given land resources are essentially the same with the plan as they would be without the plan. Further, it is more profitable for the given enterprise to continue to use the given land resource even without the beneficial effect of the plan than to locate at the next most efficient location. Net income change can then be measured as the difference in net income accruing to the enterprise on the specified land resource without the plan compared with what that enterprise

would receive as net income with the plan on the same land resource.

(b) Changes in land use. Two situations are covered by changes in land use. These are:

(i) The situation in which the landowner benefiting from the change in land use would only utilize the land resource affected by such activity once the plan has become operative. In other words, it would not be as profitable for the benefiting landowner to utilize the affected land resource unless improved through one of the activities in this category as compared with the next most efficient location. Without such a plan the improved enterprise would occur at an alternative location. Net income change to the landowner will be measured as the difference in net income from the enterprise at an alternative location that would be utilized without the plan compared with the net income received from the enterprise at a new location which is improved or enhanced as a result of the plan.

(ii) The situation in which enterprises that would otherwise employ a given land resource would be precluded from using the given land resources with implementation of the plan. Other enterprises less prone to incur flood damages or other adverse consequences would be allowed to use the given land resources.

Beneficial effects to the enterprises from activities in this category would be evaluated by measuring the net income change for the enterprise precluded from using the given land resources with the plan as compared with the without situation, plus the net income change for the enterprise that would be allowed to use the given land resource with the plan as compared with the without situation.

(c) Estimates of damage prevention and other measures. In the above cases, where it is not possible to directly employ net income changes to derive benefits, the estimate of actual or prospective damages to the physical properties of the enterprises involved can be employed as an approximation of net income change.

(The last two paragraphs of this section are deleted.)

c. Power. With respect to the computation of beneficial and adverse effects of increases in output or more efficient use of electric power it is emphasized that where appropriate, these should be viewed and evaluated as increments to planned or existing systems. Power supplied for general community and residential use can be considered as a final consumer good. Its value as a final good is generally

reflected by the satisfaction of individual residents or in terms of improved community services and facilities. Electric power provided to industrial, commercial, and agricultural uses is viewed as an energy input to the production of goods and services from these activities resulting in an increase in the output, reduction in the cost of production, or a combination thereof. The total value of electric power to the producers using such power is reflected in their *marginal willingness to pay*. However, there usually does not exist a market that directly equates users' valuation of electric power with the full marginal cost of its supply. This is because electric power is seldom priced at its marginal cost. Where an electric utility is practicing long run marginal cost pricing, the users' willingness to pay for additional supplies is verified if the utility is willing to contract for additional water supplies at the cost of providing those supplies. In this case an appropriate estimate of the benefits can be derived from the marginal rates charged.

Industrial self supply is also an example of a situation in which the beneficiary may be paying the full marginal costs of supply of electric power and where such costs can be the basis for estimating benefits. Estimates of willingness to pay may also be derived by econometric methods applied to appropriate data concerning the use of electric power and its price. Where direct estimates of willingness to pay are not available, the value of additional electric power will be measured instead by taking account of the resource cost of the most likely alternative. The alternative selected must be a viable one in terms of engineering.

The costs should include any required provisions for protection of the environment. However, since the addition of a hydroelectric project to an electric system in lieu of an alternative power source usually will either increase or decrease the unit cost of producing power by existing generating facilities of the system, this cost differential must be taken into account in determining the power value of the hydroelectric project.

Normally, electric power is evaluated in terms of two components—capacity and energy. The capacity value is derived from a determination of the fixed costs of the selected alternative source of supply. The energy value is determined from those costs of the alternative which relate to and vary with the energy output of the alternative plan. These capacity and energy

components of power value are usually expressed in terms of dollars per kilowatt per year of dependable capacity and mills per kilowatt-hour of average annual energy.

d. Transportation (Navigation) (No change).

e. Recreation.

(The following completely replaces the existing section.)

Outdoor recreational activities include water-dependent activities such as swimming, boating, water-skiing, and fishing and water-enhanced activities such as camping, hiking, picnicking, hunting, birdwatching, wildlife photography, sightseeing, and other activities. A portion of the public recreational demands are accommodated by the existence and development of Federal lands, waters, and multi-purpose water projects which include specific provisions for enhancing recreation activities consistent with the requirements of the Federal Water Project Recreation Act of 1965 (Pub. L. 89-72). This act provides that full consideration shall be given to the opportunities which multi-purpose and other Federal water projects afford for outdoor recreation and for fish and wildlife enhancement.

For the most part, outdoor recreation is produced publicly and distributed in the absence of a viable market mechanism. While the private provision of recreation opportunities has been increasing in recent years, analysis of recreation needs is conducted in the absence of any substantial amount of feedback from effectively functioning markets to guide the evaluation of publicly produced recreation goods and services. Under these conditions—and based on a with and without analysis—the increase in recreation provided by a plan, since it represents a direct consumption good, may be measured or valued on the basis of simulated willingness to pay. In computing the projected recreation demand, however, the analysis should take explicit account of competition from recreation opportunities within the area of influence of the proposed plan.

There are in existence a number of methods, or approaches, to approximating demand and what people are willing to pay for outdoor recreation. Among these are the *travel cost approach, the willingness to pay or contingent valuation survey approach, and the unit day value approach*. These methods are summarized below.

(1) *Travel cost method*. Using marginal travel costs (i.e. variable costs of automobile operation and opportunity cost of leisure time spent in travel and on the site) taken as a measure of what

people are willing to pay for water-oriented recreation and how price affects use, the relationship between price and per capita attendance can be established for recreation sites and market areas. This relationship, the conventional demand curve having a negative slope, sums up the response of users' demand to alternative prices of the recreational product (or experience). The area under this demand curve to the left of the capacity constraint plus any user fees measures total willingness to pay for recreation opportunities at the site.

(2) *Contingent valuation method*. Annual willingness to pay can be obtained directly from potential visitors by a survey which establishes a simulated market. Users are allowed to bid on the annual use of the site until the maximum willingness to pay is established. This method may be applied where lack of data, insufficient variability in travel costs, or unique characteristics of the site make use of the travel cost method inappropriate.

(3) *Unit day value method*. Where use of a demand estimating technique such as travel cost or contingent valuation methods is not cost effective because of the small size of the project, a single value per recreation day may be chosen from a range of values. These ranges will reflect availability of general or specialized recreation opportunities, location of the site relative to alternative opportunities, and characteristics of the user population. Specialized recreation involves activities for which opportunities are limited, intensity of use is low, and often may involve a large personal expense by the user. General recreation embraces the majority of recreation activities associated with water projects, including swimming, picnicking, boating, and most warm water fishing.

f. Commercial fishing and trapping (No change).

g. Other program outputs (No change).

3. Measurement of increases in output resulting from external economies.

Technological external economies are the beneficial effects on individuals, groups, or industries that may or may not benefit from the direct output of the project. They result from a plan if an increase in the output of final consumer goods or intermediate goods takes place beyond that which would be obtained in the absence of the plan and over and above direct outputs of the plan. This increased output may result from firms which are subject to the incidental, unintended, and uncompensated effects of the plan taking advantage of more efficient production techniques and

thereby releasing resources for use in producing other goods and services.

The change in net income of the economically related firms will be used as an indicator of the value of this type of national economic development effect. Changes in the total value of consumer goods due to externalities because of a plan can be accounted for by using measurement techniques like those described above. (The rest of this section is deleted.)

4. Special beneficial effects from use of unemployed or underemployed labor resources (No change).

G. Adverse Effects on National Economic Development

Achievement of beneficial effects on national economic development, and/or environmental quality, requires resources to be diverted from alternative uses. The adverse effects on national economic development are the economic value that these resources would have in their alternative uses. Generally, market prices provide a valid measure of the values of goods and services foregone in alternative uses. *Where market prices are not available, surrogate values may be used as set forth in the Manual of Procedures for Evaluating Benefits and Costs of Federal Water Resources Projects published by the Water Resources Council.* Both public and private costs associated with the plan will be measured to indicate the total adverse effect on national economic development incurred to realize the desired objectives.

1. *Sources of adverse effects.* Water and land resource plans result in adverse effects to national economic development in two ways.

a. Resources required or displaced to produce final or intermediate goods and services. In situations where a physical structure is necessary to obtain the desired objective, the adverse effects on national economic development include all explicit cash expenditures for goods and services necessary to construct and operate a project throughout a given period of analysis *plus any uncompensated economic losses to the public sector based on applicable surrogate values. The cash expenditures* consist of actual expenditures for construction; transfers from other projects, such as costs for reservoir storage; development costs; and interest during construction. If the output of the plan is an intermediate good or service, the associated costs incurred by the intermediate product user in converting it into a marketable form will be measured. These associated costs are borne by the user of the plan output but

nevertheless, represent resource requirements necessary to convert the project output into a product demand by society. Examples are production costs incurred by users of plan outputs, and costs to other producers or to processors that arise in conjunction with the physical flow of the output of the plan. Associated costs should be deducted from the value of gross outputs to obtain net beneficial effects to be compared with the national economic development adverse effects of a plan. These adverse effects occur as a result of certain resources being released and subsequently unemployed as a result of the implementation of the plan.

In situations where nonstructural measures are used to obtain the desired objective, the adverse effects on national economic development will include *the uncompensated economic losses to the public sector plus payments for such things as the purchase of easements or rights-of-way and costs incurred for management arrangements or to implement and enforce necessary zoning.* In some cases, actual cash expenditures will not be involved as when local communities are required to furnish lands, easements, and rights-of-way.

- b. Decreases in output resulting from external diseconomies (No change).
- c. Cost adjustments (No change).
- 2. Measurement of adverse effects.
 - a. Resources required for or displaced by the plan.

Resource requirements of the plan are the sum of (1) the market values of private sector goods and services used for installations; interest during construction; operation, maintenance, and replacement; and induced costs as well as (2) *the surrogate value of uncompensated economic losses to the public sector.*

Installation costs are the market values of goods and services necessary to implement a plan and place it in operation, including management and organizational arrangements, technical services, land, easements, rights-of-way, and water rights; initial and deferred construction; capital outlays to relocate facilities or to prevent or mitigate damages; transfers of installation costs from other projects; and all other expenditures for investigating, surveying, planning, designing, and installing a plan after its authorization.

Operation, maintenance, and replacement costs are the market values of goods and services needed to operate an installed plan and to make repairs and replacements necessary to maintain the physical features in sound operating condition during their economic life.

b. Decreases in output resulting from external diseconomies (No change).

H. Beneficial and Adverse Effects on Environmental Quality (No change.)

III. Other Beneficial and Adverse Effects (No change)

IV. General Evaluation Standards

Introduction (No change)

- A. General Setting (No change)
- B. Measurement of Beneficial and Adverse Effects (No change)
- C. Price Relationships (No change)
- D. The Discount Rate (No change)
- E. Consideration and Comparison of Alternatives (The following completely replaces the current section.)

A range of possible alternatives capable of application by various levels of government and nongovernmental interests should be systematically evaluated in terms of their contributions to national economic development and environmental quality objectives. A comprehensive range of alternatives should be evaluated toward balancing water availability over time against competing purposes.

Water conservation shall be fully integrated into project and program planning and review as a means of achieving both the national economic development and environmental quality objectives. Water conservation consists of actions that will (a) reduce the demand for water; (b) improve efficiency in use and reduce losses and waste; and (c) improve land management practices to conserve water. A clear contrast is drawn between the above conservation elements and storage facilities for new supplies.

In addition, a primarily nonstructural plan will be prepared and included as one alternative whenever structural project or program alternatives are considered. This alternative plan should incorporate a combination of nonstructural or demand-reducing measures which would feasibly (in light of the national economic development and environmental quality objectives) be employed or adopted to achieve the overall project purpose.

Nonstructural measures are complete or partial alternatives to the traditional structural measures in addressing water resources problems and needs. The ideal nonstructural alternative is the least cost, implementable modification in public policy, management practice alteration, regulatory change or pricing policy modification which would bring marginal benefits and marginal costs for each project output into equality. The two objectives of national economic

development and environmental quality are to serve as the basis for the measurement of costs and benefits.

The assessment of nonstructural measures as alternatives to traditional structural measures should be considered for all water resources planning purposes including water supply, flood control, power, transportation, recreation, fish and wildlife, and other purposes.

Nonstructural measures may require less capital investment and may produce less adverse impacts than traditional structural measures.

A nonstructural measure (or measures) may in some cases offer a complete alternative to a traditional structural measure (or measures). In other cases, a nonstructural measure (or measures) may be combined with fewer and/or smaller traditional structural measures to produce a complete alternative. It may at times be necessary to combine structural and nonstructural measures to formulate alternative plans for attainment of the planning objectives.

A "primarily nonstructural plan" is an alternative plan which makes maximum feasible use of nonstructural measures as a means of addressing water resources problems and needs. The determination of maximum feasible use will be based upon the maximum possible use of nonstructural measures which contribute to the National Economic Development objective and/or the Environmental Quality objective and which meet the tests of acceptability, effectiveness, efficiency and completeness.

Alternatives should not be limited to those the Federal Government could implement directly under present authorities. Therefore the cooperative role of local, State, regional, and Federal organizations in implementing alternatives will be stressed. Plans, or increments thereto, will not be recommended for Federal development that, although they have beneficial effects on the objectives, would physically or economically preclude alternative non-Federal plans which would likely be undertaken in the absence of the Federal plan and which would more effectively contribute to the objectives when comparably evaluated according to these principles.

The alternative non-Federal plan that would likely be physically displaced or economically precluded with development of the Federal plan, or increments thereto, will be evaluated for purposes of this determination on a comparable basis with the proposed Federal plan with respect to their beneficial and adverse effects on the

objectives, including the treatment of national economic development effects and the discount rate used in the evaluation. Taxes foregone on the proposed Federal plan and taxes paid on the non-Federal alternative will be excluded in such comparisons for the evaluation of the national economic development objective.

F. Period of Analysis (No change)

G. Scheduling

Plans should be scheduled for implementation in relation to needs so that desired beneficial effects are achieved effectively. Beneficial and adverse effects occurring according to different patterns in time are affected differently by the discount process when plans are scheduled for implementation at alternative future times. Therefore, plan formulation should analyze the alternative schedules of implementation to identify the schedule that would result in the most desirable mix of contributions to the objectives when the beneficial and adverse effects of a plan are appropriately discounted.

While beneficial and adverse effects toward the objectives will accrue over different time frames for the alternative implementation schedules, the discounted equivalent of such beneficial and adverse effects to be considered in the comparison of the alternative implementation schedules should represent the present value of the beneficial and adverse effects toward the objectives for each alternative implementation schedule at a common point in time.

H. Risk and Uncertainty (No change)

I. Sensitivity Analysis (No change)

J. Updating Plans (No change)

V. Plan Formulation

A. Introduction

As set forth in principles, plans will contribute to meeting current and projected needs and problems as identified by the desires of people in such a manner that improved contributions are made to society's preferences for national economic development and environmental quality.

1. Major steps in plan formulation.

Plan formulation is a series of steps starting with the identification of needs and problems and culminating in a recommended plan of action. The process involves an orderly and systematic approach to making determinations and decisions at each step so that the interested public and decisionmakers in the planning organization can be fully aware of the basic assumptions employed, the data

and information analyzed, the reasons and rationales used, and the full range of implications of each alternative plan of action. This process should be described in enough detail in the report of the study so that it may be replicated by others. The plan formulation process consists of the following major steps:

1. Specify components of the objectives relevant to the planning setting; *The specific level of future needs will give consideration to firm and household response to existing laws and policies including conservation measures;*

2. Evaluate resource capabilities and expected conditions without any plan;

3. Formulate alternative plans to achieve varying levels of contributions to the specified components of the objectives, *including preparation of one primarily nonstructural alternative;*

4. Analyze the differences among alternative plans to show tradeoffs among the specified components of the objectives'

5. Review and reconsider, if necessary the specified components for the planning setting and formulate additional alternative plans as appropriate' and

6. Select a recommended plan from among the alternatives based upon an evaluation of the tradeoffs between the objectives of national economic development and environmental quality. (The rest of this section remains unchanged.)

2. Levels of Planning (No change)

B. Specification of components

Introduction (No change)

1. National economic development. For the national economic development objective, the components will usually be expressed at two levels.

- a. The first level directly relates to the objective in the sense of the specification of the actual outputs of goods and services desired. Hence, the first level of specified components of this objective will generally be depicted in terms of increased outputs of goods and services or their more efficient production such as the following:

- Increased or more efficient output of food and fiber;

2. Increased or more efficient output or recreational services, *and efficient use of facilities;*

- (3) Increased or more efficient production *and use of energy;*

- (4) Increased or more efficient production *and use of transportation services;*

- (5) Increased productivity of land for residential, agricultural, commercial and industrial activities;

(6) Increased or more efficient *production and use* of necessary public services such as municipal and domestic water supply; and

(7) Increased or more efficient industrial output.

b. The second level of specification of the components of the national economic development objective follows from the translation of the first level specification of needs for goods and services into specific needs for water and land resources. In the context of the above, the second level specification of components would be established in terms such as the following:

(1) Water and land for *use in* irrigation;

(2) *Expanded opportunities for diversified* water and land related recreation activities;

(3) *Balancing energy use with production capacity;*

(4) *Inland navigation or deep draft harbor facilities in the context of total transportation needs;*

(5) *Reduction of flood hazard;*

(6) *Balancing water use with supply for domestic, industrial and municipal purposes; and*

(7) *Instream flow needs.*

(The rest of the section remains unchanged.)

2. Environmental quality. (No change)

3. Participation. (No change)

4. Projected conditions. (No change)

5. Sensitivity tests. (No Change)

6. Preferences. The specification of the components of the objectives must reflect the specific effects that are desired by groups and individuals of the planning area as well as the specific components declared to be in the national interest by the Congress or by the executive branch through the Water Resources Council. In this way the components of objectives will reflect local, State, and national preferences and priorities as well as the extent of complementarity and conflict among components.

In this regard, the identification and detailing of the components of the objectives should be viewed as the process of making explicit the range of preferences and desires of those affected by resource development in terms of reference that can form the basis for the formulation of plans. Rather than a single level of achievement being set forth for any specified component, a range of possible levels should be set forth so that the relevant preferences can be seen for a given component. It should be anticipated that the initial specification of components will be modified (expanded or reduced) during subsequent steps in plan formulation to

reflect the capability of alternative plans to *contribute to satisfaction of* component needs and to reflect technical, legislative, or administrative constraints.

C. Evaluation of Resource Capabilities

In very broad terms, the first step of specification of the components of objectives can be viewed as establishing the boundaries of demand (needs or problems) in the context of each objective. In the next step, evaluation of resource capabilities, the initial evaluation is made of the supply (availability) of the resources that can be employed to satisfy the current and future levels of demand. *Also considered are conservation measures that can alter future demand.*

Resources of the planning area shall be evaluated in terms of their ability to meet the current and projected demands identified for each component under two sets of conditions:

(1) Capability of resources without any planned action; and

(2) Capability of water and land productivity enhanced through management plans. An analysis of the capability of resources to meet the projected demands without any planned action will reveal the extent and magnitude of unsatisfied component needs and indicate the requirement for some specific plan of action to contribute to their satisfaction. To the extent that the water and land resources without any planned action are unable to meet current and projected needs or to the extent that resource management enables the needs to be met more efficiently, there is an evident justification for formulating alternative plans to *balance water available and water demanded for alternative uses.*

In this formulation step, the first task is to undertake a selective inventory of the quantity and characteristics of water and land resources of the planning area and an appraisal of opportunities for further use of these resources. Problems limiting the use of resources should also be identified.

The resources inventory should include data on all physical factors appropriate to the investigation. Examples of the type of information needed include:

1. Hydrologic data such as rainfall and runoff characteristics, frequencies of high and low flows, *the conjunctive relationship of ground water with surface water including*, natural lakes, marshes, and estuaries. (The rest of this section remains unchanged.)

D. Formulation of Alternative Plans

In the first two steps in the plan formulation process, the components of the objectives were specified in terms of needs and problems, the resource capability within the planning areas were evaluated, and the broad outlines of management, development, and other actions were identified. The next step is to undertake the actual design and scaling of alternative plans.

Ideally, in the presence of a situation where there are few or no constraints on planning and where the components of the objectives are essentially complementary (the satisfaction of one component need does not preclude the satisfaction of the other component needs), the formulation of a single plan would be sufficient. The only test required would be that the plan was the most efficient plan to satisfy the specified level of component needs. Although in only a few instances will this situation occur, the case does help to establish the guidelines and criteria to judge the range of alternative plans that could be formulated and the tests to be applied in formulating any given plan.

The requirement for the formulation of alternative plans derives from the basic characteristics of the approach when more than one objective is involved. First, instead of the component needs of the two objectives being complementary, it is more likely they will be in conflict—the satisfaction of one will reduce the satisfaction of others. Second, given uncertainty with respect to future economic and demographic changes and the general uncertainty with respect to future preferences for the environmental quality objective, a single specified level of achievement or need satisfaction for any given component is not likely to be acceptable through time. Other factors contributing to the necessity for formulation of alternative plans include limited resources, technical planning constraints, and legal and administrative constraints.

In formulating plans to meet the components of the two objectives, both structural and nonstructural measures shall be considered. A nonstructural measure (or measures) may in some cases offer a complete alternative to a traditional structural measure (or measures). In other cases, a nonstructural measure (or measures) may be combined with structural measures to formulate alternative plans that attain the planning objectives.

Suggestions as to the determination of the general nature and types of alternative plans which should be formulated and the number of

alternatives which should be developed with each general type are given below.

A first requirement is to determine the general types of alternatives to be developed under alternative assumptions concerning the level and magnitude of component needs in the future. Given alternative assumptions concerning future economic and demographic trends for the planning setting and the total range of component needs related thereto, a set of alternative plans should be prepared for each major assumption concerning the future. In those planning situations where there does not exist a strong linkage between water and land development and major shifts in economic and demographic trends, the Council's baseline projections will generally be used as a single set of assumptions about the future level of component needs required. Where the linkage is sufficiently strong so that water and land development may materially alter future economic or demographic trends, this relation should be reflected in alternative assumptions. Where the planning area may be unusually susceptible to other factors that could easily change in the future, it will be appropriate to establish a basis for a different set of alternative plans based on alternative assumptions concerning future change. In this instance, a sensitivity check should be made to ascertain the extent to which component needs will vary significantly given different assumptions concerning the future. If no significant variation is found, only one set of alternative plans will have to be developed.

Within a given set of assumptions concerning future change and the component needs associated thereto, the number and types of alternative plans to be developed will be determined by applying the following:

1. On a first approximation basis array component needs that are essentially complementary—that is, the satisfaction of one of these component needs does not preclude satisfaction of the other component needs or does not result in materially adding to the cost of satisfying the other component needs in the array; and

2. From the above approximation, it should be possible to group component needs and the elements of a plan to satisfy those needs that are essentially in harmony, each set representing the nucleus for an alternative plan.

At this step, relevant alternative means of meeting each of the component needs to be included in an alternative plan should be identified. All relevant means should be considered. An analysis should be made for each

alternative means, including an identification of the beneficial and adverse consequences to other component needs. The assembly of information on alternative means of contributing to meeting the component needs will provide a basis for selecting the most effective means, or combination of means of contributing to satisfaction of all component needs.

The significance of this step is threefold: (1) It provides information on the effectiveness of alternative means of contributing to satisfaction of a component need; (2) it provides information on the extent of complementarity or conflict among component needs in relation to a particular means; and (3) it provides a basis for selecting alternative means for contributing to satisfaction of a component need in the formulation of an alternative plan.

At this point, it should be possible to formulate alternative plans built upon the set of complementary component needs and plan elements. These essentially are the building blocks for the formulation of alternative plans. In formulating a given alternative plan, initial consideration will be given to its orientation toward contributing to the component needs for one of the objectives. Further additions should be made for the component needs of the other objective, provided that their addition to a given plan does not significantly diminish the contributions of the overall plan to that objective toward which the plan is oriented. An analysis of the alternative plan, in terms of beneficial and adverse effects, will reveal the extent of any shortfalls against the other objective. The process is then repeated until sufficient numbers of alternative plans have been formulated so that there is at least one plan that generally satisfies each specified component need of the objectives. This does not mean that there must be a plan for each objective that excludes plan elements that significantly contribute to the component needs of the other objective nor does it mean that a given alternative plan cannot appropriately satisfy the component needs of both objectives. Additional alternative plans may be required where there are possible conflicts among the component needs within a given objective.

A precise number of alternative plans cannot be specified in advance but will be governed by the relevancy of the objectives to a given planning setting, the extent of component needs and their complementarity, the available alternative means, and the overall

resource capabilities of the area under study.

A comprehensive range of alternative projects, programs and policies which, over time, can balance water demanded for alternative purposes with water availability should be evaluated. An evaluation of alternatives should be considered in water resources planning to serve needs including: Water supply for municipal, industrial, and agricultural uses; recreation; hydroelectric power; navigation; flood hazard reduction; fish and wildlife; and others. Both nonstructural and structural alternatives should be considered. Structural alternatives may serve a single need or multiple needs and include dams, reservoirs, levees, channels, dikes (and drainage).

Nonstructural alternatives for municipal and industrial water supply include, but are not limited to:

- (a) *Reducing the level and/or altering the time pattern of demand by metering, leak detection and repair rate structure changes, regulations on use such as plumbing codes, education programs, drought contingency planning;*

- (b) *Modifying management of existing water development and supplies by recycling, reuse, pressure reduction; and*

- (c) *Increasing upstream watershed management and conjunctive use of ground and surface waters.*

Nonstructural alternatives for irrigation water supply include, but are not limited to:

- (a) *Reducing the level and/or altering the time pattern of use through irrigation scheduling, modified water rate structures, leak detection and repair, recycling, and reuse;*

- (b) *Modifying management of existing water development and supplies by tailway recovery and phreatophyte control.*

Nonstructural alternatives for recreation and fish and wildlife include, but are not limited to, enhanced management of existing sites, and capacity management to distribute users of existing sites.

Nonstructural alternatives for hydroelectric power include, but are not limited to:

Reducing the level and/or time pattern of demand by time of day pricing, utility sponsored loans for insulation, appliance efficiency standards, educational programs, inter-regional power transfers, and increased transmission efficiency.

Nonstructural alternatives for navigation include, but are not limited to, lockage charges to reduce congestion, improved scheduling of lock arrivals, use of switch boats for locking through tows.

Nonstructural alternatives for flood hazard reduction include, but are not limited to:

(a) *Reducing susceptibility to flood damage by land use regulations, redevelopment and relocation policies, disaster preparedness, flood proofing, flood forecasting and warning systems, floodplain information, floodplain acquisition, floodplain easements;*

(b) *Reducing the adverse burden of flooding by flood insurance and flood emergency relief programs,*

(c) *On site detention of flood waters by protection of natural storage areas such as wetlands and in man-made areas such as building roofs and parking lots.*

To facilitate comparisons and tradeoffs among alternative plans and comparisons of beneficial and adverse effects measured in nonmonetary terms with beneficial and adverse effects measured in monetary terms, one alternative plan should be formulated in which optimum contributions are made to the component needs of the national economic development objective. Additionally, during the planning process at least one alternative plan will be formulated which emphasizes the contributions to the environmental quality objective. *In addition, a primarily nonstructural plan shall be prepared and included whenever structural project or program alternatives are considered. Other alternative plans reflecting significant tradeoffs between the national economic development and environmental quality objectives may be formulated so as not to overlook a best overall plan. (The rest of this section remains unchanged.)*

E. Analysis of Alternative Plans (No change)

F. Reconsideration of Components and Alternative Plans (No change)

G. Plan Selection

The culmination of the plan formulation process is the selection of a recommended plan from among the alternative plans. Based upon the analysis of alternative plans and the results of reiterations of the plan formulation process, a set of alternative plans should be developed—each one of which, given the relevant mix of contributions to components of the objectives, could be selected on its own merits as a recommended plan or recommended course of action. It is from among these alternatives that a recommended plan will be selected.

The previous formulation steps should effectively screen the number and types of alternatives that are to be considered

as candidates for a recommended plan. In general, these alternatives should possess the following characteristics:

1. For the given set of component needs, each alternative plan should be the most efficient means to achieve those needs.

2. The plans should be significantly differentiated from each other, primarily in terms of emphasis on objectives; that is, each alternative plan makes a unique contribution to one or both objectives not provided for by any of the other alternatives under consideration. Using the analysis of alternatives, those alternatives that may have been formulated with essentially similar characteristics in terms of component needs with only minor differences should be screened to select the alternative that provides the best mix of contributions to the specific set of component needs.

3. Without regard to assigning priorities or weights to the component needs of a particular alternative to differentiate such alternative in terms of the other alternatives, each alternative must be "justified" in the sense that in the judgment of the planning organization the total beneficial effects (monetary and nonmonetary) to the objectives relevant to the alternative are equal to or exceed the total adverse effects (monetary and nonmonetary) to those objectives.

Given the above screening process, the choice of a recommended plan from among the remaining alternatives is essentially a choice governed by a reasonable and rational perception of priorities and preferences about the mix of objectives. It is not a choice predicated upon an analysis of the most justified plan, since each alternative to be considered at this step of the overall formulation process can be justified on its own merits in terms of its contributions to the given mix of component needs relevant to each alternative.

If explicit priorities or weights were assigned to the beneficial and adverse effects to each component need of the objectives, it would be possible to select a best plan to be recommended with a minimum of judgment. In most cases, however, such priorities or weights will not be available and, as set forth in Principles, selection of a recommended plan will be based upon an appraisal so that the beneficial and adverse effects to the mix of objectives, to the best of current understanding and knowledge, reflect the priorities and preferences expressed by the public at all levels to be affected by the plan.

The basis of selection will be fully reported upon indicating all

considerations made in the selection process. A recommended plan (*when considered individually on the basis of with-project and without-project comparison*) must be justified on the basis that combined beneficial NED and EQ effects outweigh combined adverse NED and EQ effects. *Therefore, a plan lacking net NED benefits may be recommended when EQ benefits are sufficiently large, even though the latter are not stated in dollar terms. A Departmental Secretary or head of an independent agency may make an exception to the net benefits rule if he determines that circumstances unique to the plan formulation process warrant such exception.*

An explicit presentation will be shown of the comparisons and resulting tradeoffs of the recommended plan to other alternative plans considered for recommendation. This will be shown in accordance with the system of accounts in section VI.

VI. Systems of Accounts (No change)

VII. Cost Allocation, Reimbursement, and Cost Sharing (No change)

VIII. National Program for Federal and Federally Assisted Activities (No change)

IX. Coordination and Review of Planning Studies (No change)

Approved: October 25, 1979.

Cecil D. Andrus,
Chairman.

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